the entire district was covered by snow, excepting Kansas and the southwest portions of Missouri and Nebraska.

Winter navigation was maintained as usual on Lake Michigan, and frequent storms affected vessel interests. Advices were sent to the open ports in advance of the storms, and no casualties have been reported. Shipping, however, has suffered much from the immense amount of ice in the lake, and frequently boats have been held fast for several days at a time.—*H. J. Cox, Professor and District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

The most important features of the weather during the month were the decided falls in temperature which occurred on the 2d, 3d, 11th, 21st and 22d, 26th, and 29th, for all of which cold-wave warnings were issued. Frost and temperature warnings were issued on several dates for the benefit of the sugar and trucking interests, and they proved satisfactory to growers. High winds occurred at some points along the Gulf coast on the 2d, 3d, 20th, 21st, 22d, and 26th, for all of which timely warnings were ordered.—*I. M. Cline, District Forecaster.*

DENVER FORECAST DISTRICT.

Severe cold spells were notably absent, and but few special warnings were issued or needed. Such sharp temperature falls as occurred were local in character, and were quickly followed by mild weather. There was no interruption to railroad traffic in the mountains, and on the whole the weather conditions were favorable to live stock interests on the plains.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

December was unusually dry and January was also a month of drought. In the southern portion of the State, with the exception of rain on the 18th and 19th, the month was without precipitation. This condition in the very heart of the rainy season is unusual. In the northern portion of the State the rainfall has likewise been very light. The month began with moderate rains in the central and northern portions of the State, but these were quickly followed by cold, dry weather and heavy, low fogs.

A disturbance which appeared on the morning of January 15 moved eastward, but another disturbance on the morning of January 17 moved southward and caused general rain in California, with high southerly winds. Southeast storm warnings were displayed from San Francisco northward, and advisory messages were sent to southern ports. Both forecasts and warnings were verified. Frost warnings were issued on January 19, 20, and 21. Heavy frosts were reported at nearly all points on the 20th, 21st, and 22d.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND FORECAST DISTRICT.

From the 3d to the 17th storms frequently occurred on the north Pacific coast. Those of the 8th, 13th, and 16th were the most severe. During the storm of the 8th the steamer *Clallam*, plying between Seattle, Wash., and Victoria, B. C., was so buffeted by the waves that she sprung a leak and sank off Dungeness Spit early the next morning. Over fifty lives were lost by this disaster. An investigation as to its cause has been held by the steamboat inspectors, but their decision has not yet been made public. The fact remains, however, that storm warnings were flying in Seattle when the vessel left port, and about two hours later she entered the safe harbor at Port Townsend, where storm warnings were also displayed. The captain, however, regardless of the warnings, proceeded to sea and lost his boat and many precious lives. Storm warnings were displayed well in advance of every storm, and no other casualties occurred during the month, except a few of minor character.

On the evening of the 19th the conditions indicated much colder weather during the next twenty-four hours in the western portions of the district, and cold-wave warnings were issued to all stations. The drop in temperature, while marked and general, did not reach the zero point, except in eastern Oregon.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The Mississippi River continued solidly frozen from its source to below the mouth of the Des Moines River. It was also frozen at Hannibal from the 3d to the 21st, inclusive, but moved out on the 22d, under the influence of the heavy rains and higher temperatures of the 20th and 21st. The ice went out on a water stage of 9.5 feet, which increased to 11 feet by the 24th. On this date a gorge formed about four miles below Hannibal, backing up the water to such an extent that it reached a stage of 12.2 feet on the Hannibal gage on the 26th, exceeding all previous January records by 1.2 feet. Warnings of the expected rise were issued on the previous day. After the 26th the water slowly receded. The mean stage of the water for the month, 7.2 feet, was a very unusual condition. In fact, the lowest stage for the month, 4.2 feet, has been exceeded but twice during the past twelve years by the highest stage of any other January. The heavy rains and high temperatures of the 20th and 21st also started the ice in the lower Des Moines River, but it was checked at its mouth by the solid Mississippi ice. This caused the usual back water, and the result was a rapid flooding, on the 22d, of the low lands on both sides of the Des Moines River.

There was also considerable increase in the thickness of the ice in January. At St. Paul it increased from 18 to 26 inches; at Dubuque, from 10 to 24 inches; and at Davenport, from 9 to 20.5 inches. The Missouri River ice increased in thickness from 14.5 to 29.5 inches at Bismarck; from 12 to 19 inches at Sioux City; and from 6 to 13 inches at Omaha. Below Omaha the usual large quantities of floating ice were observed. A little ice was observed as far south as Memphis on the 8th, but there was none of consequence until the 30th, when the heavy ice of both the Ohio and Mississippi rivers passed down, interfering with, but not totally interrupting, navigation. In the Ohio River the conditions were such as to require constant vigilance, the culmination coming with the breaking up of the large gorges in the Allegheny and Monongahela rivers on the 22d, and the 30-foot flood at Pittsburg on the 26th, which reached the mouth of the river at the end of the month. The following report of the Pittsburg flood and its antecedent conditions was prepared by Mr. Frank Ridgway, official in charge, United States Weather Bureau office, Pittsburg, Pa.

The peculiar precipitation conditions which had prevailed throughout the Allegheny and Monongahela valleys during the most of the summer and all of the fall and early winter of 1903, contributed very largely in making this one of the most interesting and singular floods in the history of high water in this locality. From about July 1, 1903, to about the middle of January, 1904, very little precipitation had occurred in the entire Monongahela Valley, so that the water in that stream had reached a very low stage, which continued until the eve of the recent flood; on the other hand, the precipitation in the Allegheny Valley and tributaries during this same period was quite general, and at times excessive, monthly rises occurring in that stream. About the middle of November, after the cold weather had set in, frequent heavy snowfalls occurred throughout the Allegheny Valley, the snow averaging from 3 to 5 feet in depth until the arrival of the moderating weather which resulted in the flood. During this same period, however, the snowfall in the Monongahela Valley was comparatively light. These general conditions necessarily determined the fact that a sudden thaw, with the absence of rain, would result in an extensive freshet out of the Allegheny River, but with comparatively little water from the other river. The unusually long period of severely cold weather resulted in the formation of extremely heavy ice, which reached a thickness of from 18 inches to 2 feet on both rivers throughout their entire length, and also on all their tributaries. In addition to the frozen condition of the stream, as above stated, there had also formed three formidable ice gorges in the lower 50 miles of the Allegheny River, due to a slight moderation on December 23, 24,

and 25. These gorges subsequently became thoroughly frozen and consolidated into huge masses in three separate places, causing the heaviest ice that has occurred in these streams for the past twenty-five years.

From the above conditions it was evident that a sudden thaw, accompanied by a considerable rainfall, would speedily move the ice out of both rivers, and it was deemed of extreme importance, therefore, that all interests that would be subjected to the ravages of ice and high water should be kept awake to the great necessity of properly guarding their property against a sudden breaking up of the ice.

The first indication of a storm that promised sufficient precipitation and rise in temperature to effect a high stage of water and a general breaking up of the ice appeared on the weather map of January 20, in the Southwest, and true to expectations it continued its movement to the northeastward, resulting in heavy rains over the entire Allegheny Valley on January 21 and 22, with an average aggregate of 1.72 inches for each station in that district. During the same time, however, only a comparatively small amount of rainfall occurred over the Monongahela Valley, averaging for the three days but 0.72 inch. Until January 20 the temperature had been moderate, but on the morning of January 21 it was sufficiently high to produce a rapid melting of the vast quantities of snow which covered the ground in this locality.

On the morning of January 21 no rises in excess of 0.5 foot were reported from any of the upper river stations. Nevertheless, on account of the heavy rains which fell during the preceding night, high temperatures, and the prospective weather conditions, it was deemed advisable to call for frequent special reports after 12 noon of that day. The conditions in the evening indicated that there was no probability of any part of the ice coming out during the night, or of high water that would necessitate the removal of goods in the low portions of the cities, and this information was freely communicated to the various interests. Nevertheless it was considered highly probable that the breaking up of the ice in the tributary streams, and in parts of the main streams, would occur during the night, and the office was therefore placed in touch with those stations which could be reached by telephone, and was kept open continuously until the regular reports came in on the following morning.

At 3:00 a. m. on January 22 information was received of a breaking up of the ice at various points along both streams for some distance above Pittsburg. This information was immediately sent out to such interests as were most concerned, and advices given to prepare for a general movement of the ice and excessive rises of water within a few hours. The regular morning reports from the upper river stations, January 22, while showing comparatively small rises, except at Freeport, on the Allegheny River, indicated heavy rainfalls during the night, which, accompanied by the high temperatures then prevailing, necessarily presaged a flood stage. These reports also indicated a general breaking up and movement of the ice throughout the Youghiogheny Valley, and it was also certain that the entire mass of ice in the Allegheny would shortly come out, and that, too, in advance of the Monongahela River ice, a condition which the oldest navigator could not recollect having previously experienced; yet the very erratic rises reported were such as to be of little value in determining the probable extent of the flood that was certain to occur.

Owing to the absolute necessity of, and the imperative demands for, immediate information as to the probable height of the water, I issued a general warning at 11:35 a. m., for a stage of 25 feet or over by evening, and also that all preparations should be made for not less than 30 feet, the final stage. Although still unsatisfactory, owing to the ice gorges all along the rivers, the afternoon special reports enabled me to determine upon a definite stage at 4 p. m., when another general warning was issued through the police departments and the press, and to all interests that could be reached by telephone and telegraph, for a maximum stage of 30 feet by noon of January 23. At the same time a warning was telegraphed to all interests at Wheeling to prepare for a stage of from 40 to 45 feet there by noon of January 24. At 7:45 a. m. a report was received from Springdale, 17 miles from Pittsburg, on the Allegheny River, that the ice was moving out with a 28-foot stage of water behind it. This ice reached Pittsburg at 9 a. m., being the heaviest ever witnessed here, and the flow continued without cessation until long after the flood had reached a maximum. Simultaneously with the approach of this ice the rivers rose rapidly, and continued to rise during the remainder of the day. In the meantime the upper Monongahela rose very slowly, yet sufficiently to bring out the ice from the 3d, 4th, and 5th pools, below which it had previously been broken up by steamboats. The ice in the Youghiogheny River also came out, accompanied by the higher water that was in the Monongahela River. Along with the excessive stage in the Allegheny, considerable backwater, together with a very sluggish current, was produced in the lower Monongahela, the difficulty being augmented by the fact that the navigation interests had placed large numbers of their loaded craft in the mouth of the Monongahela for protection against the rush of ice from the Allegheny, which they assert is the most dangerous feature with which they have to come in contact at such times. When, therefore, the Monongahela River ice reached this narrow channel about 9 p. m., it experienced so much difficulty in forcing its way out as to cause considerable damage to many of the craft moored at that point. During the nights of January 22 and 23 constant communication was maintained with all interests that would be affected by the flood. At noon of January 23 special reports from Fairmont and points farther down the Monongahela River showed that the ice from the upper Monongahela had also broken and was coming out.

The rivers reached the danger line of 22 feet at Pittsburg at 4 p. m., January 22, and the 25-foot stage at 10 p. m., continuing to rise throughout the night, so that on the morning of January 23 a stage of 28.7 feet had been reached, indicating that the predicted stage of 30 feet would be verified about the time designated. The maximum of 30 feet occurred at Pittsburg at 3 p. m., and continued until 8 p. m., when the rivers began to fall slowly.

The persistency in the rise of the Beaver River during the morning of January 23 indicated that the stage of water at Wheeling would not be less than 43 feet nor more than 45 feet, as forecast the previous day, and a second warning was accordingly telegraphed to Wheeling to this effect. The maximum stage at Wheeling was 44.2 feet at 4 p. m. of January 24, 0.8 foot below the maximum stage predicted on January 22.

The most peculiar feature of this flood was that it was produced in greater part by the lower two-thirds of the Allegheny River and its tributaries and the Youghiogheny River. The immense quantities of snow on the ground throughout the upper one-third of the Allegheny Valley evidently held the rain which fell upon it, so that, for the time being, it did not escape into the streams; on the other hand, the rain and melted snow in the Monongahela Valley were together capable of producing only a 21-foot stage at Lock No. 4. Had the rainfall been general over both valleys, or had there been sufficient snow throughout the Monongahela Valley to have produced even a 35-foot stage at Lock No. 4 (which is 7 feet below the record at that point), the record-breaking stage of 35 feet, reached in 1832, would certainly have been passed, and the damage to property, both on the river and in the lowlands, would have been difficult to estimate. Notwithstanding the amount of snow that was melted in the valley of the Allegheny and its tributaries at the time of the recent flood, there still remains, according to the best obtainable information, from 2 to 4 feet of snow over the upper valleys, and this is being added to almost daily, so that even though the heavy ice has passed out, there still exist conditions which may, at any time, cause a repetition of the high water.

At Parkersburg the height of the flood crest was 42.4 feet on January 25, and the stages in the district varied from 42 to 44 feet. Warnings were issued January 22 to the effect that the ice gorges would probably break on that day and night, and advising that preparations be made for a water stage of 45 feet. There was no flood of consequence in the Cincinnati district, but the enormous ice gorge that formed in December, 1903, and continued during January, both above and below Cincinnati, created a situation fraught with the utmost possibilities of danger and destruction, and one that could cause only the gravest apprehensions which were prolonged without the slightest relaxation for nearly six weeks. The following report of these gorges was prepared by Mr. S. S. Bassler, official in charge, United States Weather Bureau office, Cincinnati, Ohio:

While there have been in recent years considerably lower temperatures in connection with severe but short-lived cold waves, the oldest inhabitant in this section does not recall so trying, continuous, disastrous and record-breaking a season as the current winter of 1903–04. The oldest of the river men can not recall conditions like those that prevailed during the months of December, 1903, and January, 1904. The Ohio River was frozen and gorged from its source to its mouth, the stream at many places being frozen solid to the bottom. Ice of the quantity, amount, and abnormal thickness of that that filled the Ohio from bank to bank during the current winter was probably never before seen in the history of Cincinnati. The river was not only full of ice of varying thickness, but icebergs towered here and there to heights of 20 to 40 feet.

The outlook, from a business point of view, was gloomy in the extreme, and enormous losses of floating property were anticipated. There was a complete stagnation of river business and consequent suffering among communities dependent upon river traffic for supplies.

On December 6, 1903, ice began to float by in the river, but was not sufficiently heavy to interfere with navigation. With the exception of two days, the average daily temperature was considerably below the daily normal during the month. By December 14, 1903, there was heavy floating ice and low water, and navigation was suspended. On the same day a gorge was formed at Medoc bar, below the mouth of the Big Miami River. On December 15 the river at Cincinnati was rising in consequence of the gorge below, heavy ice was passing sluggishly through the harbor and new shore ice constantly forming. On the following day ponds and lakes were covered with ice about 7 inches thick, the river was gorged at various points below and above the city, and harbor boats were busy breaking up the ice in the harbor and preventing a closed river. By December 18 the harbor was frozen over, affecting the retail coal interests. On December 19 there was no change in the river situation, the gorges above and below the city being frozen solid to the bot-

tom. On the next day the minimum temperature for the first time in the month was at the melting point, there had been heavy rains during the night, the local tributaries ran out, the ice in the river began breaking up, and the gorges moved their positions.

Very little damage resulted from this partial break-up. A few days of comparatively mild weather, freezing at night and thawing during the day, kept the river conditions practically unchanged. On December 24, the second day in the month on which the temperature was above normal, mild, rainy weather with southeast to southwest winds prevailed. These conditions were hailed with delight as being favorable for rotting the ice and facilitating the removal of the menacing gorges. The gorge above gave way, the ice passed by with little damage, and the gorge below the city let go, carrying the mass of ice to Aurora, Ind., where it held fast. The gorge at Aurora broke at 3 p. m., December 25, leaving the river free of gorged ice at this point. But there was an immediate relapse to colder weather and the next day was the coldest of the month, the average temperature being 25° below the normal for the day, and the minimum of the day 2.8° above zero. The floating ice again gorged above and below the city, practically at the same points. New ice was forming and the harbor was again full of ice from the Ohio to the Kentucky shores. But rapidly following this decline in temperature there was an unaccountable rise, so that by 2 p. m., December 27, the mercury stood at 42°. Under the influence of this thawing weather the gorges, just reformed, suddenly gave way, and there was a crushing, crunching avalanche of ice, causing wreck and ruin to floating property and involving great loss to river interests. The river was a terrific sight, a seething stream of ice, grinding, crushing, and threatening the destruction of everything in its grasp. But the gorge at Medoc bar, 16 miles below the city, held fast and was very strong, ice having piled up from 15 to 20 feet in places. By December 28, the temperature having again declined, the heavy gorge below held back the great cakes and blocks of ice as well as the water, so that there was an accumulation of 10 to 12 feet of false water on the local gage. This false, or back water, was regarded and feared as a greater menace than the ice when the final break-up occurred. A sudden run out of this local excess of water, carrying great and heavy masses of ice, was expected to result in unprecedented losses.

Every precaution to save property from overwhelming losses was taken. At 5 p. m., December 28, the ice in the harbor stopped moving. In this apparently immovable mass of ice large steamers, hundreds of loaded coal barges, and many other river craft lay helpless. The gage showed a local accumulation of 22.8 feet, while the entire river above was falling, and Portsmouth, only 113 miles away, had but 11.4 feet. On December 29 there was another quick rise in temperature, sufficient to cause a gorge above Dayton, Ky., to let go at about 1.22 p. m. This caused a break of the gorge at the Southern Railroad bridge at about 1:30 p. m. The resistless force of the moving ice and a portion of the released backwater destroyed a gorge at Andersons Ferry at 2:30 p. m. The stupendous gorge at Medoc bar let go shortly after, and the crisis was past. The fear had been great that Medoc would successfully resist, and that the great gorge above the city would let go, thus overwhelming the harbor and bottoms in front of the city with ice. The stampede of ice and false water, occurring in daytime, enabled much valuable property to be saved. Still the indirect loss was enormous. By nightfall most of the ice had been carried out of the harbor, and the present danger was passed. The water fell 6.5 feet in twelve hours. During the remainder of the month the river fell and the ice moved freely.

The New Year, 1904, began with continued suspension of navigation on account of ice. As a result of the recent break-up of gorges and the rapid rush of piled-up ice and water, the banks of the river above and below the city were strewn with wrecks and barges, and steamers lay well out of water. On January 3 there was a drop in temperature to 3° above zero, and the ice in the river again gorged at Medoc bar below the city, and gorges formed above the city. The gorges were in very much the same position as those of the preceding month. River men declared the conditions unparalleled in their experience. This frozen and gorged condition of the river continued with slight changes, according to the variations in the weather. On January 18 the gorges were greater and heavier than at any time, and a gorge formed at Buena Vista which caused a fictitious stage of water at Portsmouth, adding to the seriousness of the situation at Cincinnati. Arrangements had been made with the wharf master at New Richmond, Ohio, 20 miles above the city, and with other parties nearer by to promptly inform us by long distance telephone of the beginning of the final break. Arrangements were also made with the officials of the Cincinnati Waterworks to signal by whistles, day or night, when directed by this office, the beginning of the break-up above, the signal to be taken up by the river craft imprisoned in the ice in the harbor. On January 20 a thaw was in progress, and while the gorges held firm, the top ice was softening and honeycombing. On January 21 thawing weather continued and there was more or less rain, causing a rise in the local tributaries. During the evening the gorges above made several false starts, but the great gorge at Medoc bar, below the city, was still intact at 5:30 p. m. All coal harbors, above and below the city, were notified to expect the signal soon. At 8 p. m. the message came from New Richmond that the ice there had started to move and that it was also moving at Palestine, 8 miles below. Later on word came over the telephone that gorges and fields of ice were passing by California, Ohio, 10 miles above the city. The general alarm signal was blown at 11:15 p. m. The fields and gorges and bergs of ice passed through the harbor during the rest of the night, sweeping away the ice obstructions below the city. The intense worry and strain of the river men was practically over. Losses were heavy, but much less than expected, and much floating property that had been carried away was subsequently recovered. On January 22 all the local gorges were gone and the ice was moving freely. Following the disappearance of the local gorges came a threatening rise in the upper part of the river. On Sunday, January 24, a warning was telegraphed to Point Pleasant, W. Va., that the river there would exceed the danger line (39 feet) on the following day. On the following day Point Pleasant was warned that the river there would reach 41 or 42 feet and begin falling that night. Observers at other substations were informed that the stage of water during the current rise would not reach the danger line in the district, except at Point Pleasant. The stage at Point Pleasant reached 42.5 feet at 3 a. m., January 27. The falling river left its banks and landings in extremely bad condition. The stream continued more or less full of heavy floating ice, and navigation remained suspended at the close of the month.

Below Cincinnati the stages of water were not so high, but heavy ice was abundant, with gorges at numerous places during the first three weeks of the month.

At Cairo the heavy ice necessitated a suspension of navigation from the 4th to the 10th, inclusive, and again on the last day of the month.

The ice in the rivers of New England, the Hudson and its tributaries, increased in quantity during the month, but not to an unusual extent.

About the same time that the Pittsburg flood was raging over the western extremity of Pennsylvania, the ice in the Susquehanna River, particularly in the North branch, had created a condition of affairs alarming in the extreme. The warm rains of January 22 and 23 had started the ice, which, however, soon gorged at a small distance below Wilkesbarre, in the neighborhood of Beachhaven, causing a severe flood, which reached a stage of 31 feet at Bloomsburg from the 24th to the 26th, inclusive. During the succeeding days the gorge gradually became larger and more compact, and by the 28th there was a solid gorge of ice from 15 to 25 feet in height, extending from Beachhaven almost to Sunbury, a distance of nearly 40 miles. Towns, villages, and farms were flooded; the railroad right of way on both sides of the river was covered with masses of ice and water many feet in depth, and bridges moved from their piers. The district between Catawissa and Danville was practically isolated for several days, with no hope of relief except through the possibility of greater disaster when the ice should break up and move away. Conditions were also somewhat threatening along the West branch of the Susquehana, but were not such as to cause serious apprehension. The situation is described in the following report, by Mr. E. R. Demain, official in charge United States Weather Bureau office, Harrisburg, Pa.

At the beginning of the month the Juniata was frozen over and the West branch was generally closed above the Williamsport dam. The North branch was frozen over in places before the end of December. Continued cold weather caused the river and all its tributaries to become icebound by January 5. No material changes occurred from that time until January 22, except that the ice increased gradually in thickness, being from 1 to 2 feet thick. In a few places a thickness of 3 feet was reported on January 22. The general rain and higher temperature attending the storm over the Susquehanna Valley on January 21 and 22, caused a general break-up of the ice in all streams of the system. On the morning of January 22 the conditions had become so threatening that warnings were telegraphed to all regular river stations, and mailed to the postmasters and others at about thirty of the principal river towns, advising that the ice would probably break up on January 23 or 24. The first break occurred at Clearfield, on the headwaters of the West branch late in the afternoon of January 22, and the ice passed off on a 9-foot flood. Warnings were immediately telegraphed to Lock Haven and Williamsport. The ice broke at Huntingdon, Lock Haven, and Towanda, early on the morning of the following day; at Williamsport it began to break about 8 a. m.; at Wilkesbarre at 2 p. m.; and at Selinsgrove at 5:30 p. m. At Harrisburg the break-up began at 6:50 a. m., January 24, the ice passing out quietly on 15.5 feet of water. Between 9 a. m. and 12 noon of that date the river at Harrisburg fell about 3 feet, and the flow of ice decreased to a marked extent, giving the first intimation of possible trouble

above. On the next morning it was learned that serious gorging had occurred in the North branch, beginning at Kipps Run, a short distance above Sunbury, and extending to Berwick, a distance of about twenty-four miles, causing serious damage to towns and low-lying farm lands. At Bloomsburg the ice was piled higher than the bridge on the west bank of the river, some reports giving the height as 40 feet, and a considerable part of the town was submerged. The bridge at Bloomsburg had three spans lifted up by the ice, and the first span was moved about eighteen inches down the stream. The girders of one span went out on top of the ice, together with some of the planking. The bridge has been repaired temporarily and was open for traffic on February 3, enough of the iron work to repair one side having been recovered. The highest water at Bloomsburg was 31 feet, or 2 feet above the danger line, from January 24 to 26, inclusive; it had receded to 20 feet on January 31.

At Catawissa the water registered 30 feet, or 6 inches higher than in 1865 and 3 feet above the flood of March 2, 1902. Catawissa, Bloomsburg, Espy, Rupert, and Danville were isolated from each other and from the outside world for several days, all roads being covered with ice and water. The railroad tracks were also covered with ice and water for miles north and south of Catawissa, stopping all traffic; traction service between Catawissa and Berwick was suspended for several days on account of washouts. The ice settled about 5 feet at Catawissa on January 25 and 26. At other towns in the gorged district the conditions were similar to those described at Bloomsburg and Catawissa. The loss up to January 26 was estimated by citizens in the locality at $350,000. With the exception of the settling of the ice, and the lower water, as mentioned above, the gorge remains about the same as when first formed.

Outside of the territory affected by this gorge, the only place reporting a danger stage was Wilkesbarre, where the water rose to 20.5 feet at 6 p. m., January 23, or 3.5 feet above the danger line, remaining at that height about one hour, but doing no material damage to property. Gorges were reported at a few other points, one being at Long Level, a few miles below Wrightsville, in the lower reach of the Susquehanna, but no serious damage has thus far resulted from the smaller gorges. An ice jam caused by the accumulation of ice from the river and the Sheshequin Creek, wrecked the iron county bridge at Ulster, in Bradford County, about 10 miles above Towanda. One pier in the middle of the stream went out about 8:30 a. m. on January 23, taking two spans into the river; about two hours later the pier on the Sheshequin side fell partly over, allowing one end of the third span to drop. This bridge was built by the county in 1889 at a cost of $38,800. It consisted of four spans of 234½ feet each.

The heavy blanket of snow covering the ground at the time the storm commenced absorbed a large amount of the rain which fell over the watershed of the river on January 21 and 22, and while the depth of snow was greatly diminished by the rain and high temperature, it is estimated that less than one-half of the water in the basin passed down with the flood, being held at first by the snow and later by the fall in temperature which checked the run-off. Reports at the close of January indicate that the depth of snow in the mountains of both the North and West branches was about eighteen inches and as this is probably mostly snow saturated with water and frozen solid, the amount of water that would be released by a sudden thaw would be sufficient to cause a flood equal to one that would ordinarily result from an average of from 2.50 to 3.00 inches of rainfall over the upper watershed.

There is nothing further of special interest to be recorded. There was a moderate rise in the Altamaha system, caused by the heavy rains of January 22. Ample notice was given of this rise, which proved very beneficial to the United States Engineers, rice planters, and lumbermen, who had been anxiously awaiting moderately high water.

The highest and lowest water, mean stage, and monthly range at 199 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, District Forecaster.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during January are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—No extremely low temperatures or excessive precipitation occurred, but frequent moderately cold spells retarded fall sown wheat and oats; some sown in December had not germinated. Frequent rains kept ground generally too wet for work, though some land was prepared for next season's staple crops; more oats to be sown. Destructive windstorm in Hale County on 22d; heavy snow in north-central counties on 28th.—*F. P. Chaffee.*

Arizona.—Temperatures were generally below normal, and droughty conditions prevailed most of the month. The drought was partly relieved by snowfall in the northern portion of Gila County and in a few other localities, but the situation had become very serious over most of the Territory. Plowing and seeding were retarded by dry, cold weather. Fall sown grain was not growing well; much of it had failed to germinate. Range feed was fairly plentiful, but stock water was scarce. Stock were deteriorating.—*M. E. Blystone.*

Arkansas.—The first and second decades were mild and pleasant; A general heavy rain, turning to snow, occurred on the 21st and 22d, and was followed by continued cold weather until the end of the month. Considerable progress was made in preparing the ground for spring crops. Small grain did fairly well. Very little cotton remained in the fields. Stock were generally thrifty. Fruit was not injured to any considerable extent by the cold weather.—*Edward B. Richards.*

California.—Temperature and rainfall were below normal and crop growth was slow. The low temperature was beneficial, however, to the deciduous fruit interests, as it prevented the too early development of bloom. Severe frosts were frequent, but caused no material injury to oranges or young nursery stock. In the central and northern sections grain and grass were in good condition and large crops are expected. The drought continues in southern California and crop prospects are discouraging.—*Alexander G. McAdie.*

Colorado.—Continued mild weather was favorable to stock, which were in good to fine condition, except over portions of the eastern foot-hills region, and in localities in the Arkansas Valley and eastern counties, where poor ranges and a scarcity of water prevailed. The dryness caused some deterioration in winter grain, previously reported deficient. Snowfall was also deficient during January; precipitation, especially on the eastern and southern watersheds, scarcely made good the loss by evaporation, and the amount of moisture stored for late irrigation is the least in many years; fortunately there is still time for sufficient snowfall to insure water for irrigation during the early part of the season. The prevailing dryness of the ground will lessen the early run-off.—*F. H. Brandenburg.*

Florida.—The month was colder than the normal, with an excess of precipitation over a large portion of the State, the deficiency being in the southern section. As a rule the soil was too cold for a satisfactory growth of vegetables, which were much retarded. Frosts were numerous and, in some instances, damaging to vegetables south to Dade County. General farm work was advanced, much plowing for corn being accomplished. Citrus trees were in good condition.—*A. J. Mitchell.*

Georgia.—The temperature was decidedly below the normal, the weather being steadily cold throughout the greater portion of the month, but not severe. The precipitation was below the normal, except in the southern section. An unusually heavy snowstorm occurred in the north on the 28th, the amounts ranging from 6 to 12 inches. Land was in good condition at the close of the month; wheat backward; oats poor. Preparatory work for new crops was well advanced in some sections.—*J. B. Marbury.*

Idaho.—Temperature in eastern and southern districts generally below normal; elsewhere, above. Precipitation deficient in nearly all sections, though more of the range was snow-covered than during December, resulting in poor condition of range stock in localities; condition of domestic stock good—*E. L. Wells.*

Illinois.—Wheat and rye in the central and northern districts were in a normal midwinter condition. In the principal wheat growing section, the southern district, the crop was very uneven. During the cold wave the fields were generally well covered with snow in all districts. Pastures and meadows had been well protected during the season, and were generally promising.—*Wm. G. Burns.*

Indiana.—The month was unusually cold, but the ground was covered with snow in the northern and greater portion of the central section, so that wheat did not suffer, except from inundation on bottom lands, caused by rain and melting snow during the 19th-22d, and also possibly on flat land by a coating of ice that formed about the 23d. Adverse conditions prevailed during the planting season for wheat in the southern section and a few southeastern counties of the central section.—*W. T. Blythe.*

Iowa.—Month colder than usual, with slight excess of precipitation. First and second decades were favorable for stock feeding and usual farm operations. Severe storm of sleet and ice about 20th, followed by extremely low temperature, caused considerable damage to fruit trees, vines, timber, and telephone lines; also caused much inconvenience to stock feeders and some damage to fall grain, though the fields were covered with snow during period of lowest temperature.—*John R. Sage.*

Kansas.—Wheat was generally in good condition, and though un-